

CORRESPONDENCE

Comments on Interactions of Circulation and Weather Between Hemispheres

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Namias [1] published an interesting article on interactions of circulation and weather between hemispheres. I think, however, that his findings could be readily explained through our principle of symmetry, as presented in [2].

There, we tried to prove that, in spite of geographical factors, circulation always proceeds symmetrically for both hemispheres: for pressure is a continuous element, high (or low) values occurring simultaneously on the two margins of the equator, where no intense gradients can form. Geographical factors, however, do modify the final results: an intense Chaco Low, in South America, the result of local heating, faces an Azores High, resulting from oceanic conditions. If the former intensifies, the latter does not disappear, but weakens, as crossed by a trough, etc.

The figures contained in Namias' article confirm our hypothesis:

In figure 2a, the Icelandic Low is located at 40°W., in symmetry with another Low over northeastern Brazil, at 45°W.

In figure 2b, the Low situated at 55°W. in the North Atlantic has its symmetrical image in the Low at 55°W. in southern Brazil.

In figure 2a, pressure was very elevated in the Bermuda High, at 70°W., and also, symmetrically, in the Chile High, which faces a Canadian one.

No Bermuda High existed in figure 2b, resulting in a weaker Chile High, and in an extended low pressure area over the equatorial Pacific.

In figure 2b, both Azores and South Atlantic Highs are centered at the same meridian, 15°W. Also the Aleutian Low, much displaced to the east, is situated in the same longitude as a South Pacific trough (160°W.).

Finally, one must note that in January 1950 (fig. 4a), rains were zonally arranged, in response to the zonal disposition of 700-mb. contours (fig. 1a) in the Northern Hemisphere.

For January 1958, meridional rain bands in South America (fig. 4b) are symmetrical with the meridional contours on the 700-mb. chart (fig. 1b), which encircle the upper trough.

The true explanation of the tropical rain bands must be left to another Note, as it would require detailed description of equatorial weather. This latter, as described in our book [3] depends on tropopause displacements at the Polar Front.

In his article, Namias [1] explains that on "some occasions" standing waves may encompass the equator, in-

fluencing South American weather. In our study, we established that on "all occasions" this interaction occurs for both hemispheres.

Special chapters describe in detail the circulation observed in pairs: South America-North Atlantic, Africa-Europe, Indian Ocean-Asia, Australasia-Asia, South Pacific-North Pacific, South Pacific-North America.

Briefly, when finally accepted by meteorologists, our principle of symmetry will become a powerful instrument for the analysis of global maps.

REFERENCES

1. J. Namias, "Interactions of Circulation and Weather between Hemispheres," *Monthly Weather Review*, vol. 91, Nos. 10-12, Oct.-Dec. 1963, pp. 482-486.
2. Adalberto Serra, "Princípio de Simetria," *Revista Brasileira de Geografia* No. 3, July-Sept. 1962, pp. 377-439.
3. Adalberto Serra, *Circulação Superior*, Rio de Janeiro, 1955, 126 pp.

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REPLY

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It is gratifying to note that Dr. Serra finds confirmation of his general "principle of symmetry" in my article which, however, was meant to suggest interhemispheric interactions only under special circumstances and in special areas. It is indeed unfortunate that meteorological data in the Southern Hemisphere, particularly relating to the pressure distribution of its Centers of Action, are hardly adequate to test his principle. Even in the two cases treated in my report, it was necessary to resort to abnormalities in temperature and precipitation rather than to pressure anomalies of doubtful reality, especially since the summertime pressure variability over much of South America is small.

While the specific relationship proposed in my article, namely that Northern Hemisphere wintertime mid-tropospheric flow patterns of large amplitude tend to induce responsive features at the same longitudes of the Southern Hemisphere, is in agreement with Dr. Serra's "principle of symmetry," it must be pointed out that zonal symmetry did not appear with respect to the equator, if indeed it was present at all. If periods were selected where less abnormal circulations existed, it would seem that interhemispheric relationships would be very difficult to establish.

It is hoped that the WMO plan for a truly global network of observations supplementing those of satellites will become established so that Dr. Serra can extend or modify his intriguing hypothesis, and that other meteorologists may be encouraged to work in this most fascinating field.

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